

In the Specification:

Page 15, cancel last paragraph:

"Fig. 8 is a schematic plan view of the apparatus of the invention illustrating arrangement of all above-described position sensors 50, 52a, 52b, 54a, 54b, 56a, 56b and force sensors 60, 68a, 70a in combination with the microcontroller 66 for force sensors. The optical position sensors are connected via line 72, 74, 76, and 78 to the drive mechanisms of the mechanical hand of the robot (not shown) via the same microprocessor 66 as the force sensors."

and replace with the following new paragraph:

--Fig. 8 is a schematic plan view of the apparatus of the invention illustrating arrangement of all above-described position sensors 50 (Fig. 2), 52a, 52b, 54a, 54b, 56a, 56b (Fig. 4) and force sensors 60, 68a, 70a (Fig. 5) in combination with the microcontroller 66 for force sensors. The optical position sensors are connected via line 72, 74, 76, and 78 to the drive mechanisms of the mechanical hand of the robot (not shown) via the same microprocessor 66 as the force sensors."

Page 16, cancel the second paragraph:

"In the actual structure, the base plate 44 may have a cutout 84 (Fig. 8) to accommodate the stepper motor 42. Fig. 9 is a side view in the direction of arrow C. This view illustrates the position of the motor 42 in the slot and the position of the mapping sensor 50 with respect to the semiconductor wafer W1 in the cassette. Reference numeral W designates the same wafer after it has been gripped by the end effector 20 of the invention and lowered to the operation position shown in Fig. 9."

and replace with the following new paragraph:

-- In the actual structure, the base plate 44 may have a cutout 84 (Fig. 8) to accommodate the stepper motor 42. Fig. 9 is a side view in the direction of arrow C in Fig. 8. This view illustrates the position of the motor 42 in the slot and the position of the mapping sensor 50 with respect to the semiconductor wafer W1 in the cassette. Reference numeral W designates the same wafer after it has been gripped by the end effector 20 of the invention and lowered to the operation position shown in Fig. 9. --

Page 16, cancel the last paragraph:

"Fig. 11 is a view similar to Fig. 1, which illustrates an embodiment of an end effector 20A with a simplified arrangement of gripping elements. In the description and drawing of this embodiment, where possible, the parts identical with those of the previous embodiment will be designated by the same reference numerals with an addition of symbol "a". "

and replace with the following new paragraph:

--Fig. 11 is a view similar to Fig. 1, which illustrates an embodiment of an end effector 20A with a simplified arrangement of gripping elements. In the description and drawing of this embodiment, where possible, the parts identical with those of the previous embodiment will be designated by the same reference numerals with an addition of symbol "A". --

Page 19, cancel the second paragraph:

"In order to control the speed of operation of the stepper motor 42E and thus to adjust the speed of movements of the gripping posts on different stages of the gripping cycle, the main spring 58E is provided with a pressure sensor 59E of the type CEA-125UN-120 produced by Micro-Measurement. This mechanism is needed for precision control of the pressure between the gripping posts and the edge of the wafer W. Such a system makes it possible to divide the path of the gripping posts into portions with different speed and acceleration of movement for optimization of the gripping cycle. For example, when the gripping mechanism of the end effector 20E is open, the initial movements will be performed with an increased speed, and when the gripping pressure reaches a predetermined magnitude, the speed of the posts can be gradually reduced. Furthermore, in order to increase throughput of the wafer handling procedure, it is necessary to deliver the gripped wafer to the next operation stage with a high speed. Transfer from low speeds to high speeds is accompanied by development of significant acceleration (e.g., up to 180 inch/sec^2) to the extent that the spring-loaded grippers can move apart and release the wafer. In order to prevent this phenomenon, it is necessary to increase the gripping force at this stage of the movement. Such an adjustment could be achieved by sending an appropriate signal from the accelerometer 51 to the microcontroller 66 which will change the gripping force via the stepper motor actuator. "

and replace with the following paragraph:

--In order to control the speed of operation of the stepper motor 42E and thus to adjust the speed of movements of the gripping posts on different stages of the gripping cycle, the main spring 58E is provided with a pressure sensor 59E of the type CEA-125UN-120 produced by Micro-Measurement. This mechanism is needed for precision control of the pressure between the gripping posts and the edge of the wafer W. Such a system makes it possible to divide the path of the gripping posts into portions with different speed and acceleration of movement for optimization of the gripping cycle. For example, when the gripping mechanism of the end effector 20E is open, the initial movements will be performed with an increased speed, and when the gripping pressure reaches a predetermined magnitude, the speed of the posts can be gradually reduced. Furthermore, in order to increase throughput of the wafer handling procedure, it is necessary to deliver the gripped wafer to the next operation stage with a high speed. Transfer from low speeds to high speeds is accompanied by development of significant acceleration (e.g., up to 180 inch/sec^2) to the extent that the spring-loaded grippers can move apart and release the wafer. In order to prevent this phenomenon, it is necessary to increase the gripping force at this stage of the movement. Such an adjustment could be achieved by sending an appropriate signal from the accelerometer 51 to the microcontroller 66 (Fig. 10) which will change the gripping force via the stepper motor actuator. –

Page 22, cancel the first paragraph:

“The Y-axis movement of the end effector 20 will continue until the first through-beam sensor 56a, 56b detects the precise position of Y-axis coordinate of the front edge E1 (Fig. 4) of the wafer W1. At this moment, the through-beam wafer surface inclination sensors 52a, 52b and 54a, 54b determine the inclination of the plane of the wafer W1 with respect to the plane XY of the end effector 20. If the wafer W1 is not inclined and is ready for lifting by the robot arm and for gripping by the end-effector, beams B3 and B4 (Fig. 2) are blocked by the wafer and cannot reach the respective light-receiving elements 52b and 54b. If the wafer is inclined, one or both beams from the light transmitter can reach the respective light receiver. The latter sends a respective signal to the robot arm via the microcontroller 66 to displace the end effector until the correct position is reached and the through beams are blocked.”

and replace with the following:

--The Y-axis movement of the end effector 20 will continue until the first through-beam sensor 56a, 56b detects the precise position of Y-axis coordinate of the front edge E1 (Fig. 4) of the wafer W1. At this moment, the through-beam wafer surface inclination sensors 52a, 52b and 54a, 54b determine the inclination of the plane of the wafer W1 with respect to the plane XY of the end effector 20. If the wafer W1 is not inclined and is ready for lifting by the robot arm and for gripping by the end-effector, beams B3 and B4 (Fig. 2) are blocked by the wafer and cannot reach the respective light-receiving elements 52b and 54b. If the wafer is inclined, one or both beams from the light transmitter can reach the respective light receiver. The latter sends a respective signal to the robot arm via the microcontroller 66 (Fig. 5) to displace the end effector until the correct position is reached and the through beams are blocked. --